

GENDER CONSIDERATION IN EXPERIMENT DESIGN FOR AIR BREAK IN PREBREATHE

J. Conkin¹, M.L. Gernhardt², and J.P. Dervay³. ¹Universities Space Research Association, 3600 Bay Area Boulevard, , Houston, TX 77058-3696, jconkin@ems.jsc.nasa.gov, ²EVA Physiology, Systems, and Performance/SK2, ³Flight Surgeons Office / SD / NASA, Johnson Space Center, 2101 NASA Parkway, Houston, TX 77058-3696.

INTRODUCTION: If gender is a confounder of the decompression sickness (DCS) or venous gas emboli (VGE) outcomes of a proposed air break in oxygen prebreathe (PB) project, then decisions about the final experiment design must be made. **METHODS:** We evaluated if the incidence of DCS and VGE from tests in altitude chambers over 20 years were different between men and women after resting and exercise PB protocols. Nitrogen washout during PB is our primary risk mitigation strategy to prevent subsequent DCS and VGE in subjects. Bubbles in the pulmonary artery (venous blood) were detected from the precordial position using Doppler ultrasound bubble detectors. The subjects were monitored for VGE for four min at about 15 min intervals for the duration of the altitude exposure, with maximum bubble grade assigned a Spencer Grade of IV.

DCS and VGE Outcomes with Gender and Type of PB

PB Condition	n	%DCS	%VGE	%Grade IV VGE
Resting				
male	453	15.6	43.9	25.1
female	96	11.5	24.0	10.4
χ^2 p-value		0.37	0.00045	0.0027
Exercise				
male	166	11.4	44.5	10.8
female	51	21.5	39.2	7.8
χ^2 p-value		0.10	0.60	0.72

RESULTS: There was no difference in DCS incidence between men and women in either PB protocol. The incidence of VGE and Grade IV VGE is statistically lower in women compared to men after resting PB. Even when 10 tests were compared with Mantel-Haenszel χ^2 where both men (n = 168) and women (n = 92) appeared, the p-value for VGE incidence was still significant at 0.03. The incidence of VGE and Grade IV VGE is not statistically lower in women compared to men after exercise PB. Even when six tests were compared with Mantel-Haenszel χ^2 where both men (n = 165) and women (n = 49) appeared, the p-value for VGE incidence was still not significant at 0.90. **CONCLUSIONS:** Our goal is to understand the risk of brief air breaks during PB without other confounding variables invalidating our conclusions. The cost to additionally account for the confounding role of gender on VGE outcome after resting PB is judged excessive. Our decision is to only evaluate air breaks in the exercise PB protocol. So there is no restriction to recruiting women as test subjects.